Space Weather Technical Forecast

Issued on Tuesday, 20 September 2022 at 13:11 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Ongoing chance of M-flares/R1-R2 Radio Blackout. G1 or G2/Minor or Moderate Geomagnetic Storm intervals likely from late day 3 (22nd) or day 4 (23rd).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Moderate over the past 24 hours, with an M1.1 flare from AR3102 at 20/1122 UTC.
There are currently three numbered sunspots on the visible disc. The largest is AR3102, although this is currently stable, with a relatively simple bipolar magnetic configuration and little recent growth. AR3100 continues to decay as it approaches the west limb. AR3105 continues to rotate around the southeast limb. The small bipolar spot group just northwest is now assessed as part of AR3105, this means the group is now analysed as a Dai/ Beta-Gamma.

No Earth-directed CMEs were observed in the last 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR and ACE at L1, has slowly eased to around 450 km/s, perhaps indicating that Earth is exiting the High Speed Stream from CH23. Density was mostly at average levels. The total interplanetary magnetic field (IMF), Bt has been largely Weak at or below 7 nT. The north-south component Bz, fluctuated between -6 nT and +6 nT, but with no particularly long spells of southward (negative) orientation. The phi angle remained negative (towards the Sun). Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES16, remained close to background levels. High energy electron flux (greater than 2 MeV) was at background to Moderate, with peak value 555 pfu at 19/1400 UTC. The associated 24 hour fluence remained well below the Active (1e8 integrated pfu) threshold. Observed fluence at 20/0001 UTC was 5.52e6 integrated pfu.

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Met Office Space Weather Technical Forecast

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain Low, with a chance of isolated Moderate flaring, primarily from AR3102 or AR3105.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently expected. Slightly elevated solar winds are expected to ease towards background by day 2 (21st), with the next enhancement, from the fast wind of CH25/+ expected either late day 3 (22nd) or day 4 (23rd). Geomagnetic activity is expected to be mostly Quiet with isolated Unsettled spells. There is then potential for activity to increase to Active with G1 or G2/Minor or Moderate Geomagnetic Storms likely from late on day 3 (22nd) into day 4 (23rd).

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES-16, is expected to continue close to background levels. The high energy electron flux (greater than 2MeV) is expected to rise day 1 (19th) onward due to recent fast wind and possible CME enhancement, perhaps reaching High at diurnal peak. The associated 24-hr fluence is expected to rise, but staying below the Active (1e8 integrated pfu) threshold.

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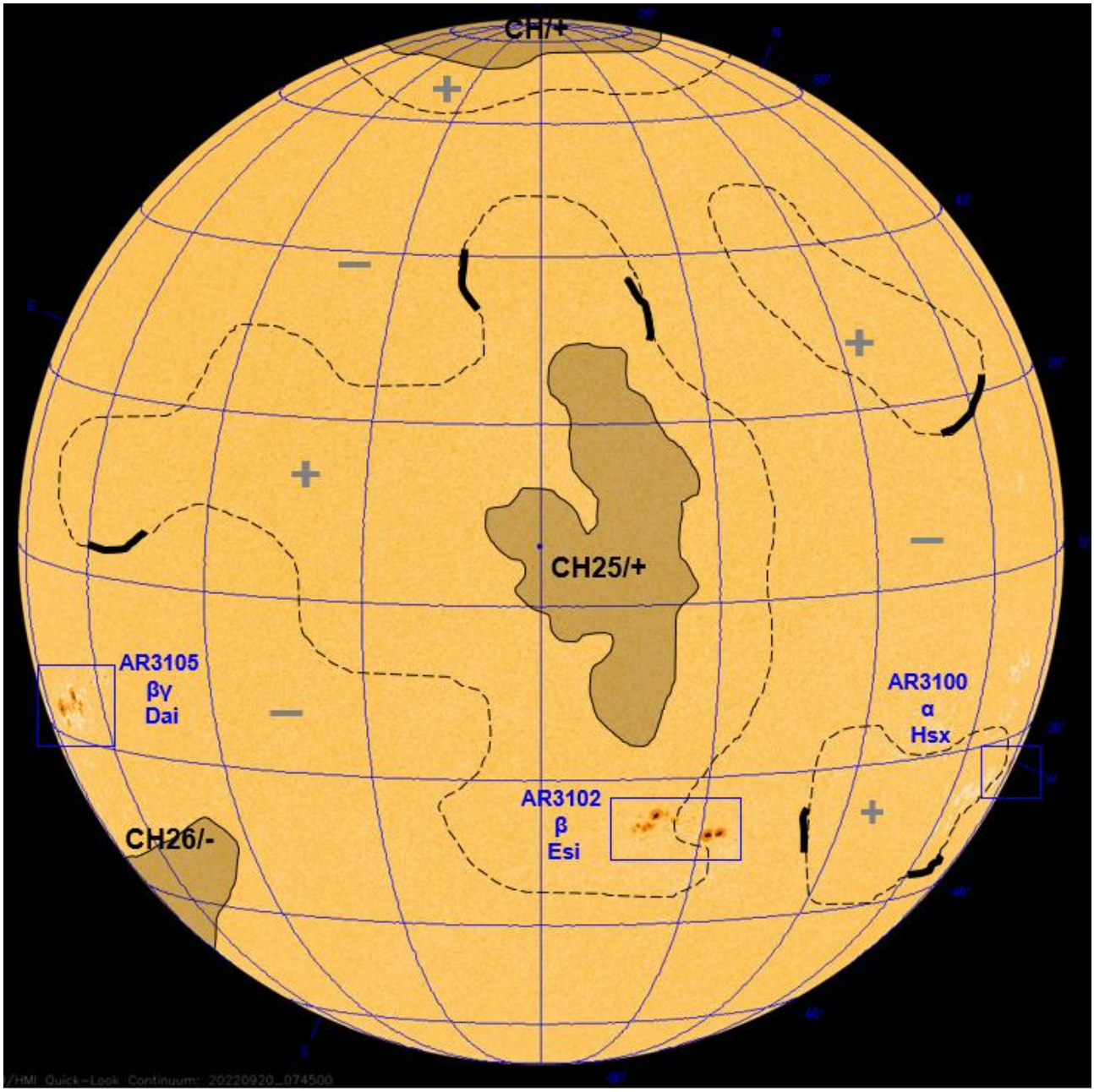
Figure 1. Solar Analysis Valid 20/0800 UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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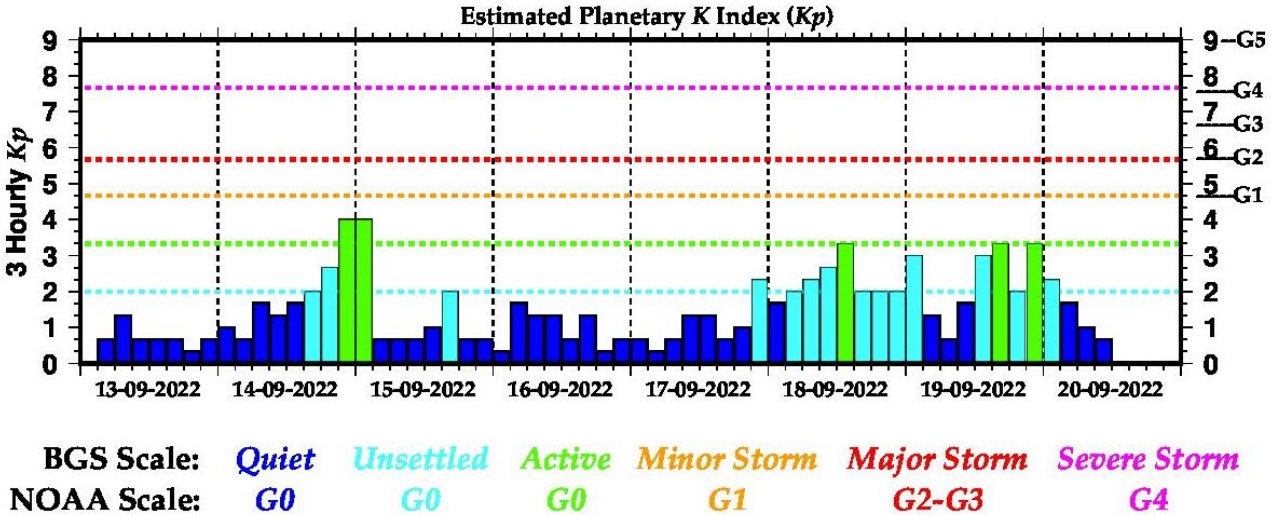
Geomagnetic Storms:

There are no CMEs (coronal mass ejections) currently expected at Earth.
Earth continues to exit the influence of negative polarity CH23, with the current slightly elevated solar winds likely easing to background by day 2 (21st). There is then the potential for further strong enhancement either later on day 3 (22nd), or on day 4 (23rd) from the arrival of the High Speed Stream from CH25/+. This arrival is uncertain however, with this feature being new on this rotation, and also currently not being captured by MOSWOC Enlil.
Geomagnetic activity is expected to be generally Quiet with isolated Unsettled spells. There is the potential for activity to increase to Active to G1 or G2/Minor or Moderate Geomagnetic Storm either late on day 3, or day 4.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	40	60
Strong	G3	No	1	1	5	5
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections- Nil

Figure 2: BGS Estimated Planetary K index (Kp)- Quiet to Unsettled (Kp1-3).



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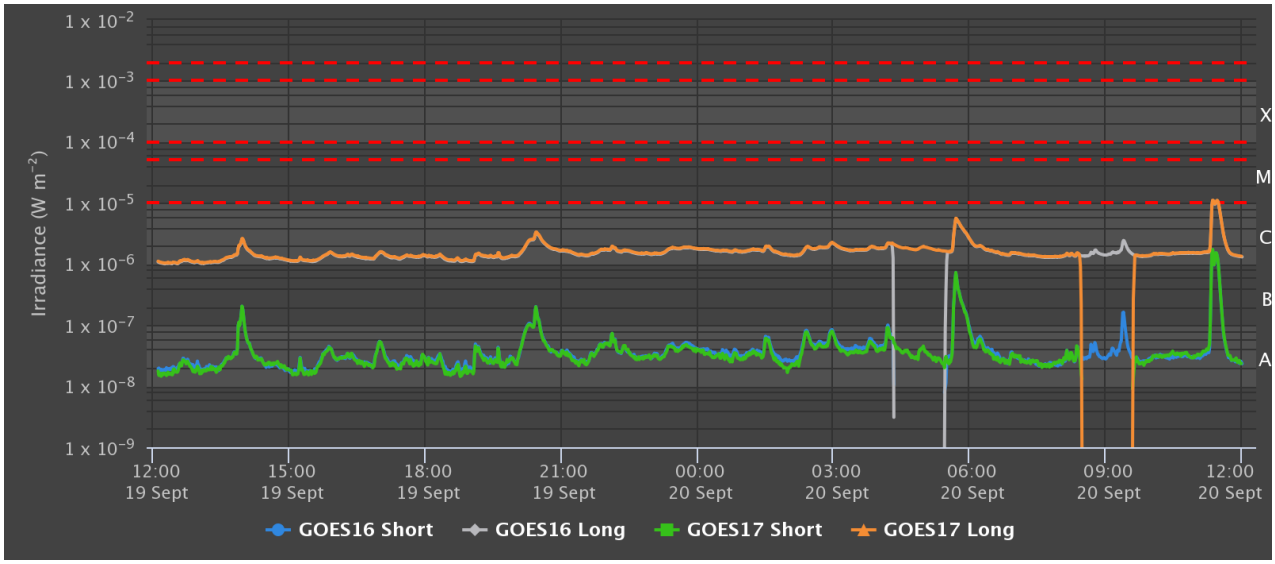
Radio Blackouts - X-Ray Flares:
There are currently three numbered sunspots on the visible disc. The largest is AR3102, although this is currently stable, with a relatively simple bipolar magnetic configuration and little recent growth. AR3100 continues to decay as it approaches the west limb. AR3105 continues to rotate around the southeast limb. The small bipolar spot group just northwest is now assessed as part of AR3105, this means the group is now analysed as a magnetically complex Dai/ Beta-Gamma. A further region appears likely to emerge around the southeast limb in the next 24 hours.

Solar activity is expected to be mostly Low, with a chance of further Moderate flaring, primarily from AR3102 or AR3105.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 M Class**	No	30	30	30	30
Very Active	**R3 to R5 X Class**	No	2	2	2	2

Figure 3: GOES16 X-Ray flares. Shows the recent M-Class flare.



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10MeV) observed by GOES-16 has drifted back close to background levels. The most likely source of any enhancement would be from any activity from AR3102 which is now located in the southwest quadrant.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	3	3	3	3
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

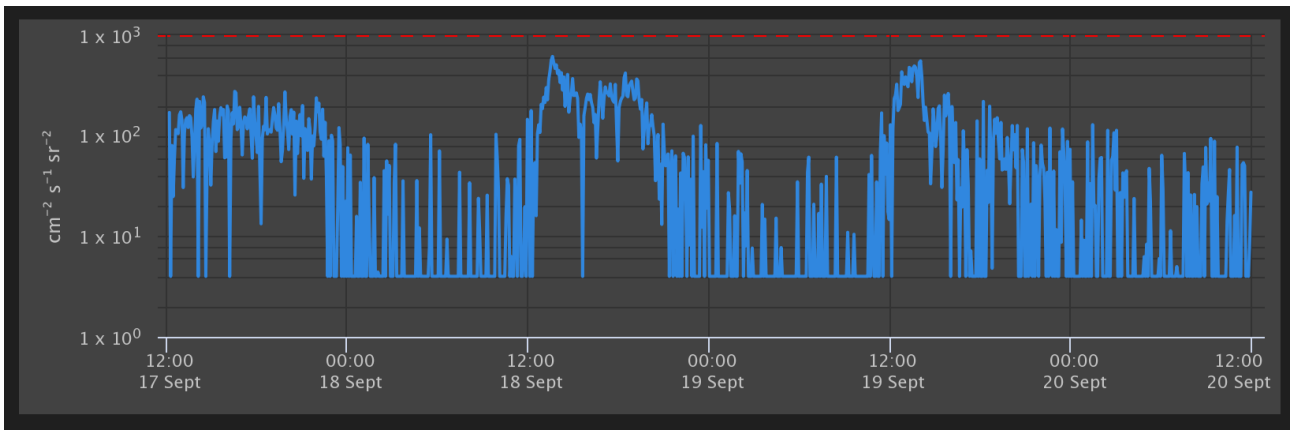
High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2 MeV) as observed by GOES-16, is currently at Background to Moderate levels. Flux levels have not responded to the current high speed stream, and seem unlikely to now rise to High levels until late in the period, when the next potentially stronger high speed stream becomes geoeffective.

The associated 24 hr fluence is expected to remain below the Active threshold, albeit with a likely rising trend late in the period. REFM is also indicating levels remaining below Active, and is considered to be giving reasonable guidance at present.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	5	5	10
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 4: GOES16 ElectronFlux has remained below 1e3pfu Alert levels over the past 3 days.



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